

# Beach Monitoring in Milwaukee: Assessing and Communicating the Risk



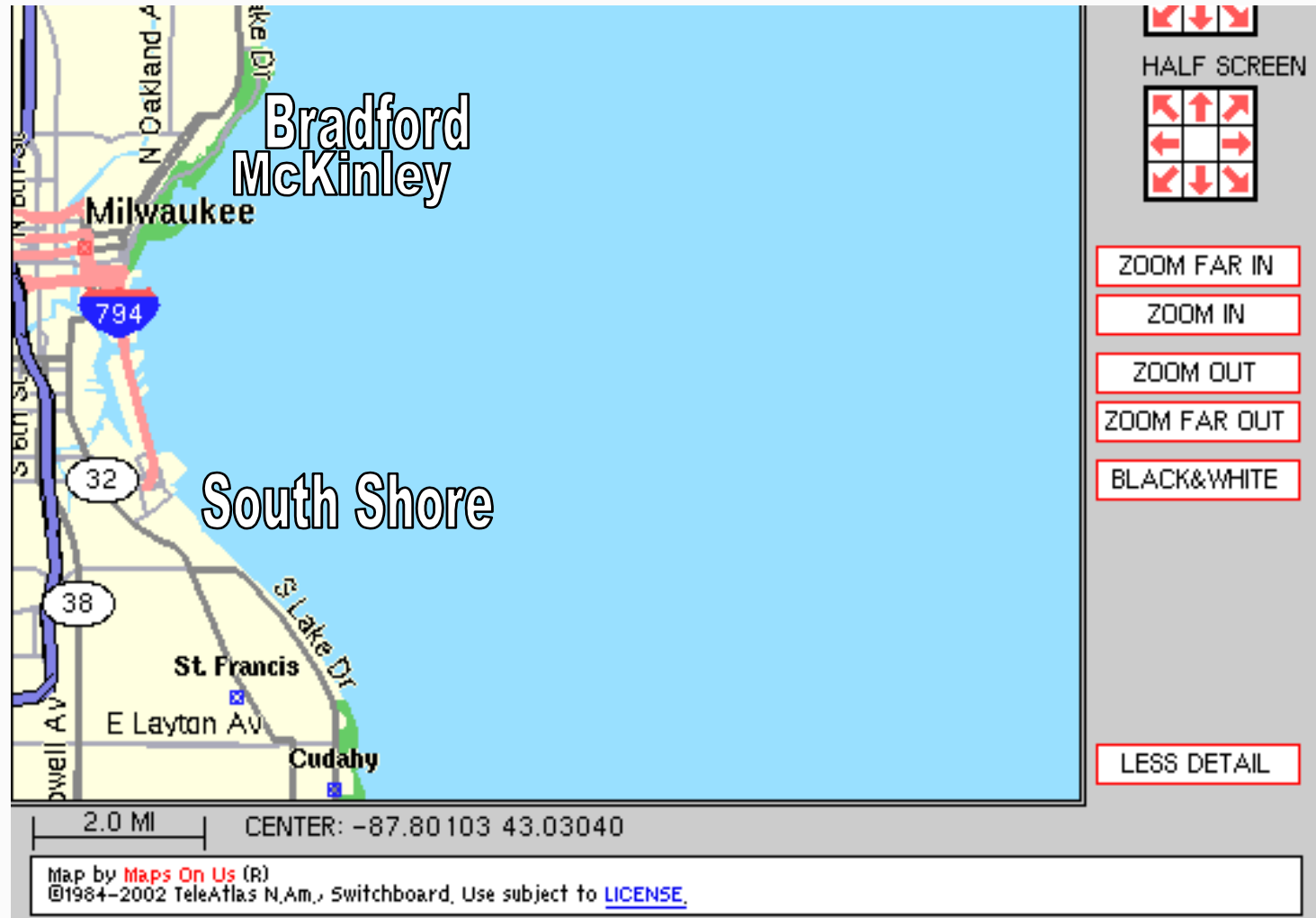
Presented By:

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# Locations of Milwaukee



# History of Beach Monitoring in Milwaukee

- ▲ *1960s - Twice-weekly sampling at select beaches and within harbor for E. coli and fecal coliform*
- ▲ *“pollution research” vs. “health risk assessment”*



# History of Beach Monitoring in Milwaukee

▲ *Early 1980s – “rainfall predictive model” developed for South Shore beach*

- > .30 inches of rainfall*
- 24 hr. “lag effect”*
- 1-4 day “closure” period*
- watershed “plume effect”*
- approx. 50% predictive*



# History of Beach Monitoring in Milwaukee: EMPACT

- ▲ *1998 EPA- Environmental Monitoring for Public Access and Community Tracking ( “EMPACT” )*
  - 7 day per week monitoring*
  - predictive model refinement/development (addl' beaches)*
  - ”real time” monitoring of select variables*
  - new format and content for risk communication (postings, website and hotline)*



# Beach Monitoring 1998-2002:

## 1. Testing for Indicator Bacteria (*E. coli*)

▲ *Test results in 18-24 hours*





## 2. Evaluation of Environmental Conditions (and environmental influences on beach)





# 3. Preparation of Advisory

- ★ *Review of previous sampling data (E. coli and rainfall)*
- ★ *Use of predictive models*

*Bradford  
South Shore*



# PILOT MODELS: BRADFORD

Prepared by Dr. Greg Olyphant

## Regression Results: Predictive Equation for Bradford Beach

$$\ln Ec = b_0 + b_1 R + b_2 Wv + b_3 CSO + b_4 Tw + b_5 \text{Algae} + b_6 \text{☺} + e$$

Ec = E.coli concentration in surf zone at Bradford (BB).

R = Rainfall (yesterday + today) at real-time meteorological station.

Wv = Wind vector (onshore component) on previous day based on data from real-time meteorological station.

CSO = Combined sewage overflow volume from MMSD.

Tw = Temperature of lake water from spot measurement.

Algae = From field observation (1=low, 2=moderate, 3=high)

☺ = Turbidity of lake water from grab sample.

e = Error term, assumed to be random and uncorrelated.



# PILOT MODELS: SOUTH SHORE

Prepared by Dr. Greg Olyphant

## Regression Results: Predictive Equation for SSB

$$\ln Ec = b_0 + b_1 R + b_2 Wv + b_3 Tw + b_4 C + b_5 \text{pH} + b_6 \text{☺} + b_7 \text{CSO} + e$$

Ec = E.coli concentration in surf zone at South Shore Beach (SSB).

R = Rainfall (yesterday + today) at real-time meteorological station.

Wv = Wind vector (onshore component) on previous day based on data from real-time meteorological station.

Tw = Temperature of lake water from SSB sonde.

C = Conductivity of lake water from SSB sonde.

pH = Negative log of hydrogen ion concentration from SSB sonde.

☺ = Turbidity of lake water from SSB sonde.

CSO = Combined sewage overflow volume from MMSD.

e = Error term, assumed to be random and uncorrelated.



## 4. Public Notification: Website, Hotline

Find out about  
today's water quality  
at the beaches

# Beachhealth

Coordinated by  
Milwaukee and Racine  
Health Departments

Date Warning Was Issued	Time Warning Was Issued	Site Name	Person Who Entered Info	Warning Level	Beach Closure?	Most recent E Coli Count (CFU/100mL)
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## 5. Public Notification: Beach. Coordination with Milwaukee County Lifeguards and Parks



## 6. Evaluation

▲ *-Website and phone hotline counts*

▲ *-EMPACT Surveys*

▲ *-BEACH Act-related surveys done  
in Summer, 2002*





# 7. Education and Outreach

## ▲ *Pollution Prevention Outreach and Education efforts:*

### *Boat waste outreach flyers*



# 7. Education and Outreach

- ★ *Pollution Prevention Outreach/Education efforts:*

*Beach Sweeps*

- ★ *Work with other agencies on pollution prevention projects*



# 2003 Beach Monitoring Program: New Regulations

- ★ *Response to EPA's Beach Environmental Access and Coastal Health (BEACH) Act (2000)*
- ★ *Applies to all components of beach monitoring and public notification*



# BEACH Act in Milwaukee

- ★ *State provides grant money to support additional monitoring costs, supplies, additional labor*
- ★ *2003 = “Pilot” Year throughout State (Beach Act Workgroup/public review)*



# Prioritization of Beaches

- ▶ *Based on access, use, number of swimmers, water quality history, pollution sources*
- ▶ *High, Medium, Low Priority*



# Number of Samples per Week

▲ *High Priority (est. 24 beaches in WI)*

*5 per week*

▲ *Medium Priority (est. 36 beaches in WI)*

*2 per week*

▲ *Low Priority (est. 40 beaches in WI)*

*1 per week*





# Changes in Beach Monitoring in Milwaukee

- ▲ *Upgrades to monitoring, advisories and public notification*
- ▲ *No changes to sampling frequency and season, environmental data recording*
- ▲ *“Beach Season” (“open” swimming season) longer*



# 1. 2003 Beach Testing

- ▶ *All 3 beaches (Bradford, McKinley and South Shore) “High Priority”*
- ▶ *Will be monitored 7 days per week*
- ▶ *2 sites at Bradford (length of beach)*
- ▶ *Monitoring starts May 5, ends September 30 (Season runs May 24-September 21)*



# 3. Advisories 2003

- ★ *Can continue to use predictive models  
(Bradford and South Shore Beaches)*





# Monitoring in Milwaukee: Past and Present

	<i>Before BEACH Act</i>			<i>After BEACH Act, 2003</i>		
<b><i>Beach</i></b>	<b><i>Monitoring Frequency</i></b>	<b><i>Length of Season</i></b>	<b><i>Number of Samples per Beach</i></b>	<b><i>Monitoring Frequency</i></b>	<b><i>Length of Season</i></b>	<b><i>Number of Samples per Beach</i></b>
<b><i>Bradford</i></b>	<i>7x/week</i>	<i>Mid June-through Mid-August</i>	<i>1</i>	<i>7x/week</i>	<i>May 19 through September 21</i>	<i>2</i>
<b><i>McKinley</i></b>	<i>7x/week</i>	<i>Mid June-through Mid-August</i>	<i>1</i>	<i>7x/week</i>	<i>May 19 through September 21</i>	<i>1</i>
<b><i>South Shore</i></b>	<i>7x/week</i>	<i>Mid June-through Mid-August</i>	<i>1</i>	<i>7x/week</i>	<i>May 19 through September 21</i>	<i>1</i>

### 3. Advisories in 2003

★ *New “2 Standard Deviations” threshold  
Event or E. coli level (recent or predicted)  
greater than higher threshold (based on  
2002 season GMs)=CLOSED*

*-Bradford: 1348 MPN/100 mL*

*-McKinley: 1076 MPN/100 mL*

*-South Shore: 1872 MPN/100 mL*





# Preparation of Water Quality Advisory

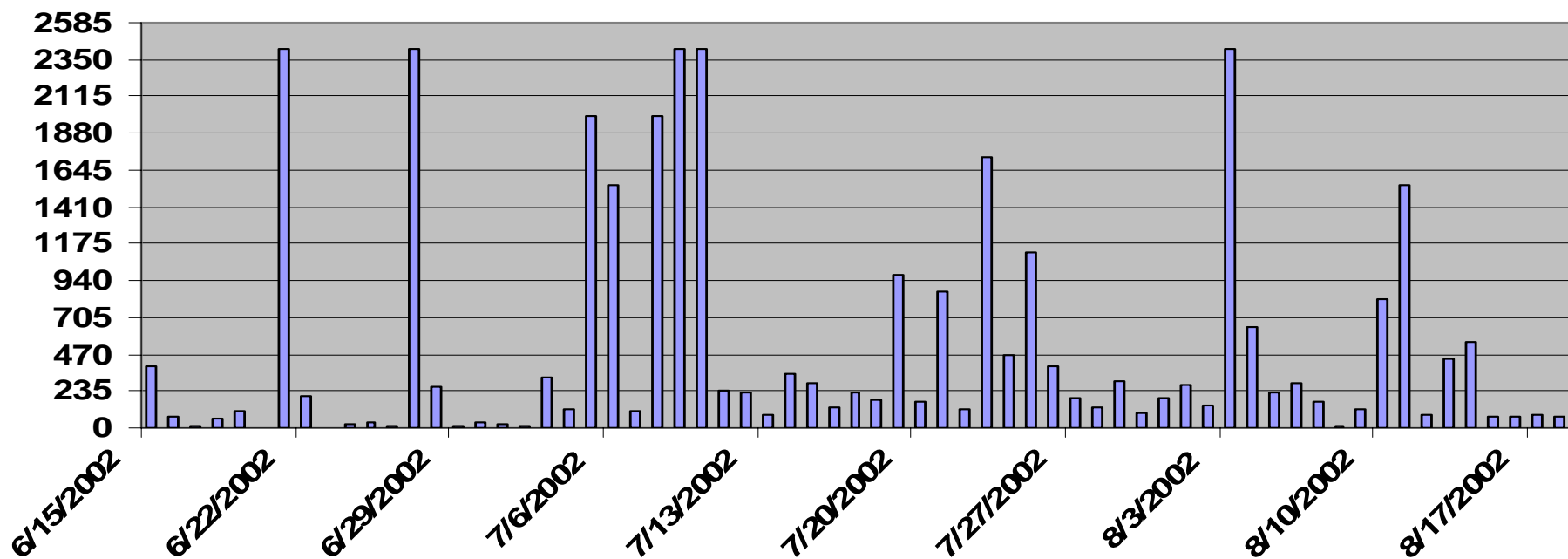
*Recent or predicted E. coli levels and  
corresponding possible advisories*

	<i>Good</i>	<i>Poor</i>	<i>Closed</i>
<i>Bradford</i>	$<235$	$\geq 235$ , check waves	<i>Event or</i> $>1348$ , check waves
<i>McKinley</i>	$<235$	$\geq 235$ check waves	<i>Event or</i> $>1076$ , check waves
<i>South Shore</i>	$<235$	$\geq 235$	<i>Event or</i> $>1872$



# *E. Coli* Levels at Bradford Beach 2002

Bradford *E. coli* MPN/100 mL



# 4. Public notification: Wisconsin Beachhealth Website, Hotline

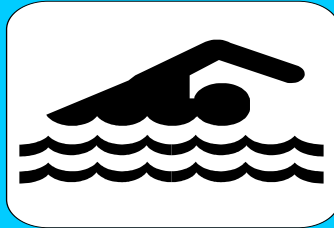
*Welcome to the Southeastern Wisconsin Beach Health website*

Date Warning Was Issued	Time Warning Was Issued	Site Name	Person Who Entered Info	Warning Level	Beach Closure?	Most recent E Coli Count (CFU/100mL)
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# 5. Public Notification at Beach

WATER QUALITY  
TODAY IS



GOOD

BASED ON RECENT MONITORING FOR *E. COLI* BACTERIA

CONTACT INFORMATION



# 5. Public Notification at Beach

## WARNING WATER QUALITY TODAY IS POOR

*Based on recent monitoring for E. coli bacteria*

### Potential Sources of Pollution

- Urban run-off
- Storm & combined sewers
- Wild animal & pet waste
- Illegal discharge of boat sewage
- Wastewater treatment plant overflows



### What Can I Do to Reduce Pollution?

- Pick up litter, especially diapers
- Bag pet waste and deposit in waste containers
- Do not feed gulls and waterfowl
- Conserve water
- Avoid using chemical fertilizers

SPECIFIC CONTACT INFORMATION GOES HERE

# 5. Public Notification at Beach



# Future Directions

- ★ *Faster Tests*
- ★ *Better Models (“neural networks,” USGS, others)*
- ★ *Better Risk Communication for populations using the beach (Spanish, Hmong)*
- ★ *New Channels of Outreach and Education*
- ★ *Assess Variability (spatial and temporal)*

